

# Data Center

Data Center and Networking  
“From the Edge to the Cloud”



# Our Mission

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At nVent, we believe that safer systems ensure a more secure world. We connect and protect our customers with inventive electrical solutions.



# nVent Financial Overview

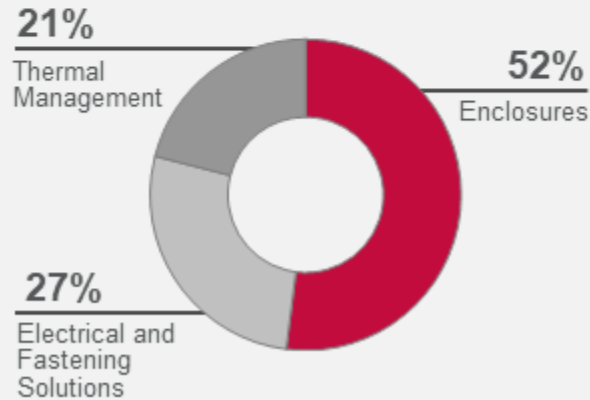
## Company Characteristics

- Leader in **connection and protection**
- Industry **leading positions and strong brands**
- Attractive **margin profile**
- Strong **free cash flow** generation
- **10,000+ employees** worldwide

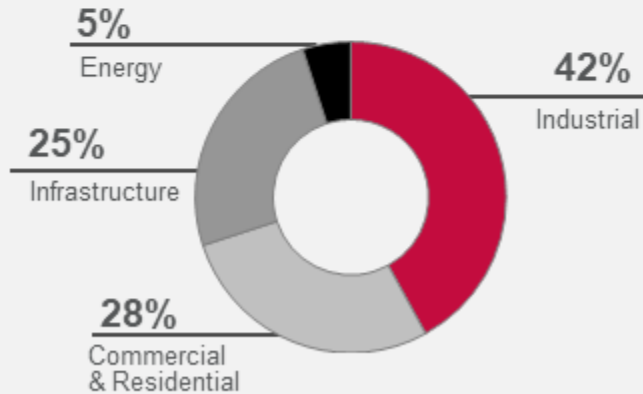
## 2022 Financials

**\$2.9B**  
Revenues

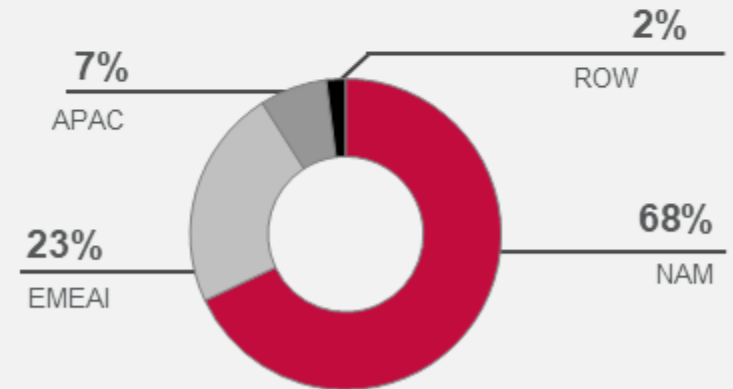
## Segments



## Verticals



## Geographies



**High performance electrical company focused on connection and protection**

# Building a More Sustainable and Electrified World



## Investing in Sustainability and Electrification

- **New Products:** by 2025 90% of our new product funnel will have positive ESG impact
- **Acquisitions:** expanding our portfolio with electrification trends, \$300M in sales in 2022

## Strong Customer Value Propositions

- Energy efficiency
- Resiliency and protection
- Time savings and labor savings
- Safety
- Product lifespan and serviceability
- Eco-friendly

## Highlighted Sustainable and Electrified Value Propositions



### Liquid Cooling

Energy efficiency

**40-60%** reduction in power consumed using precision liquid cooling versus typical air-cooled installations



### Advanced Electrical Connection Systems

Time savings

**50%** faster installation\*  
**20%** reduction in total installed cost\*



### Electrical Fastening

Time savings

Prefabricated solutions are safer for installation, require fewer tools and reduce installation time



### Hot Water Maintenance

Energy efficiency

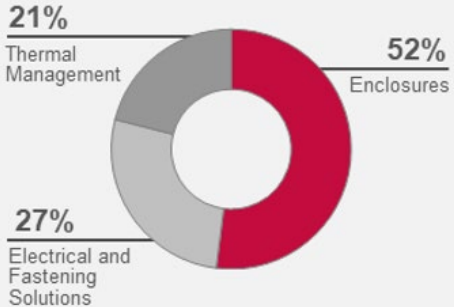
**16%** energy savings using electric heat trace for pipes for instant hot water versus recirculation systems

**Sustainability and electrification are core to our business strategy**



# Fast Facts About nVent

## Segments



## ENCLOSURES

enLOGIC by nVent

nVent  
HOFFMAN

nVent  
SCHROFF

## THERMAL MANAGEMENT

nVent  
RAYCHEM

nVent  
TRACER

## ELECTRICAL AND FASTENING SOLUTIONS

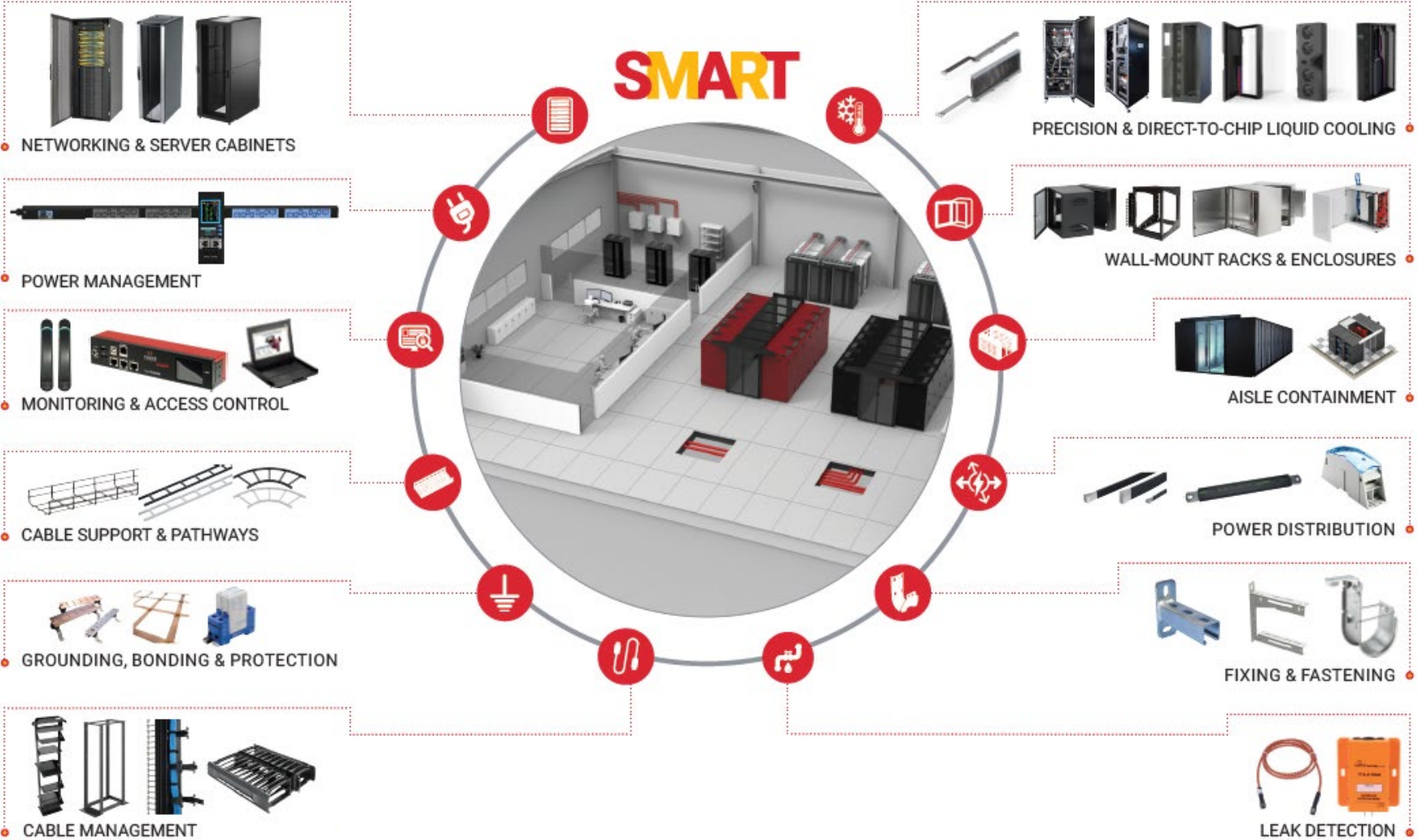
nVent  
CADDY

nVent  
ERICO

nVent  
ERIFLEX

As the world becomes more electrified, this creates more demand and more need for what we do

# NEXT GENERATION DATA CENTER INNOVATION FOR A CONNECTED WORLD



Our flexible modular portfolio, combined with design and project support, enables you to specify and deploy your project on time to ensure data and network infrastructure availability and protection.



# Data Center Cooling

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Datakeskusten uudet jäähdytysteknologiat



# What's happening?

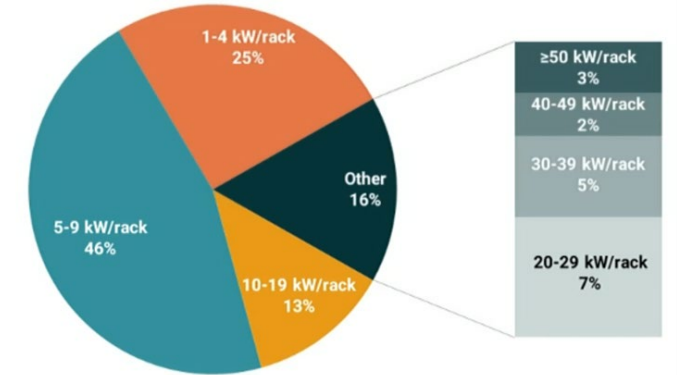
**UPTIME** → POWER / COOLING IS KEY FOR AVAILABILITY OF IT EQUIPMENT.

## CAPEX vs OPEX

- Energy consumption and TCO perspective

## DENSITY

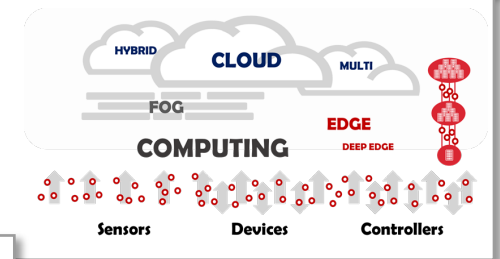
- The average density per rack was rising from 2.4kw by 6kW in the last 9 years.
- Chip power roadmap shows majority of chip power will be increasing pas the limit of air cooling within the next 24 months - Market size for liquid-based cooling techniques to grow from \$1.5B in 2020 to \$6.5B in 2027
- More compute power housed in less real estate



Source: Uptime Institute Global Survey of IT and Data Center Managers 2020, n=422

## DOWNLOAD VS UPLOAD WORLD

- Decentral installations challenge the designers and operators
- “By 2025, 75% of enterprise-generated data will be created and processed outside a traditional centralized data center or cloud” *Gardner*



## SUSTAINABILITY

Net Zero programs and Water usage restrictions, ESG targets

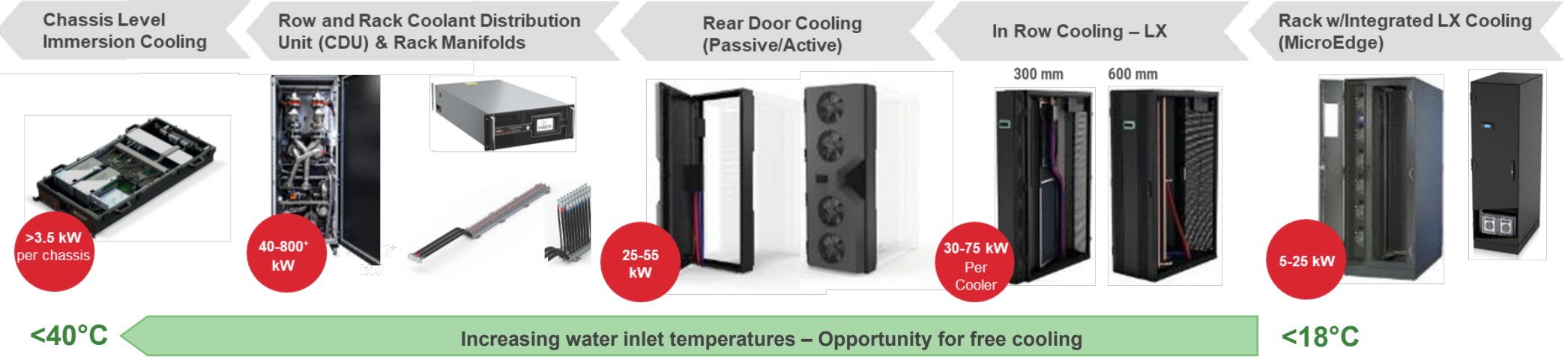


# Cooling Product Overview



## COOL THE SERVER, NOT THE ROOM

### AIR AND LIQUID COOLING SOLUTIONS



## EDGE AND WHITESPACE COOLING SOLUTIONS



# “traditional” Cooling

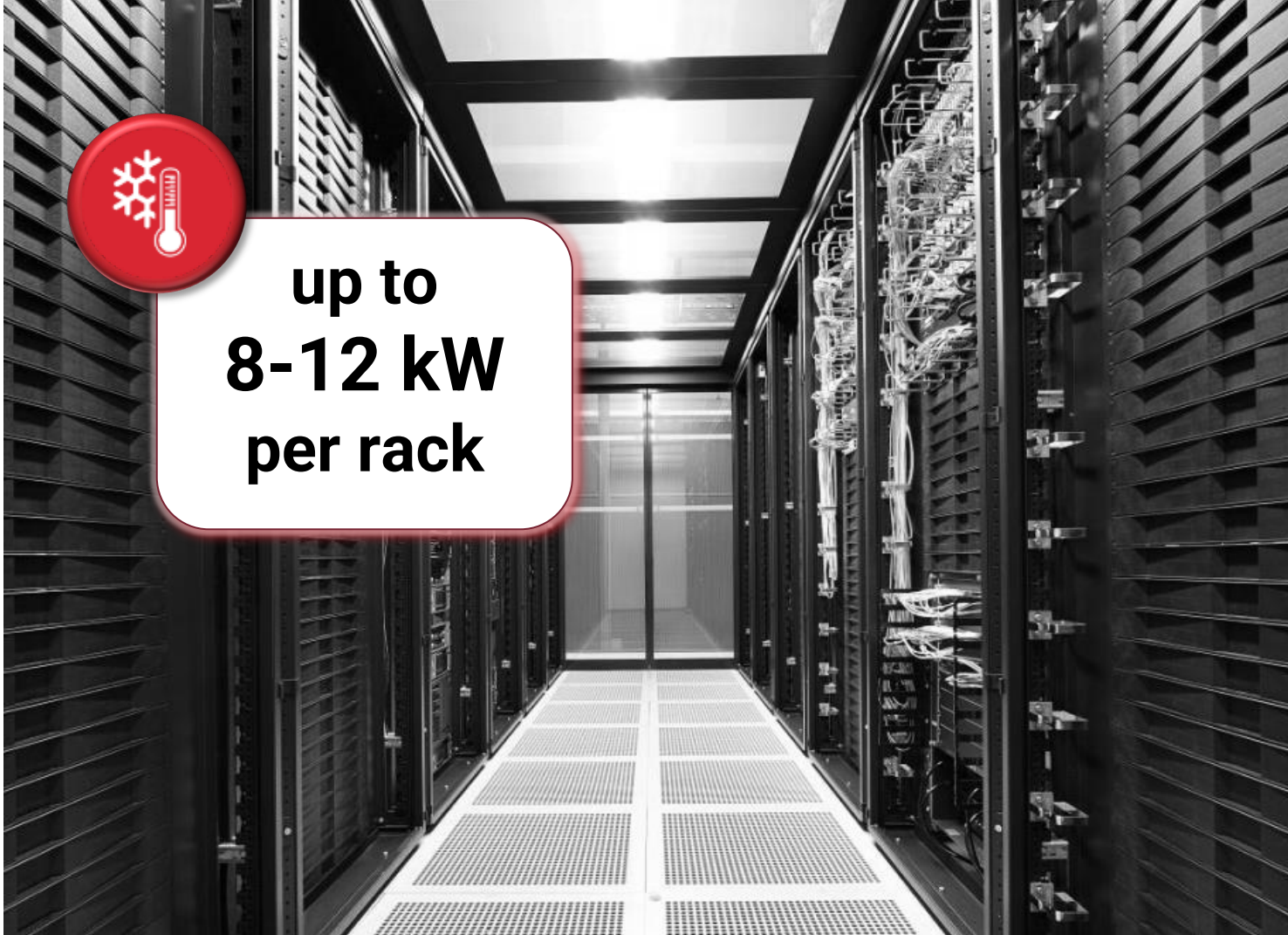
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- Containment
- Side Cooler
- Rear Door Cooler





# Containment

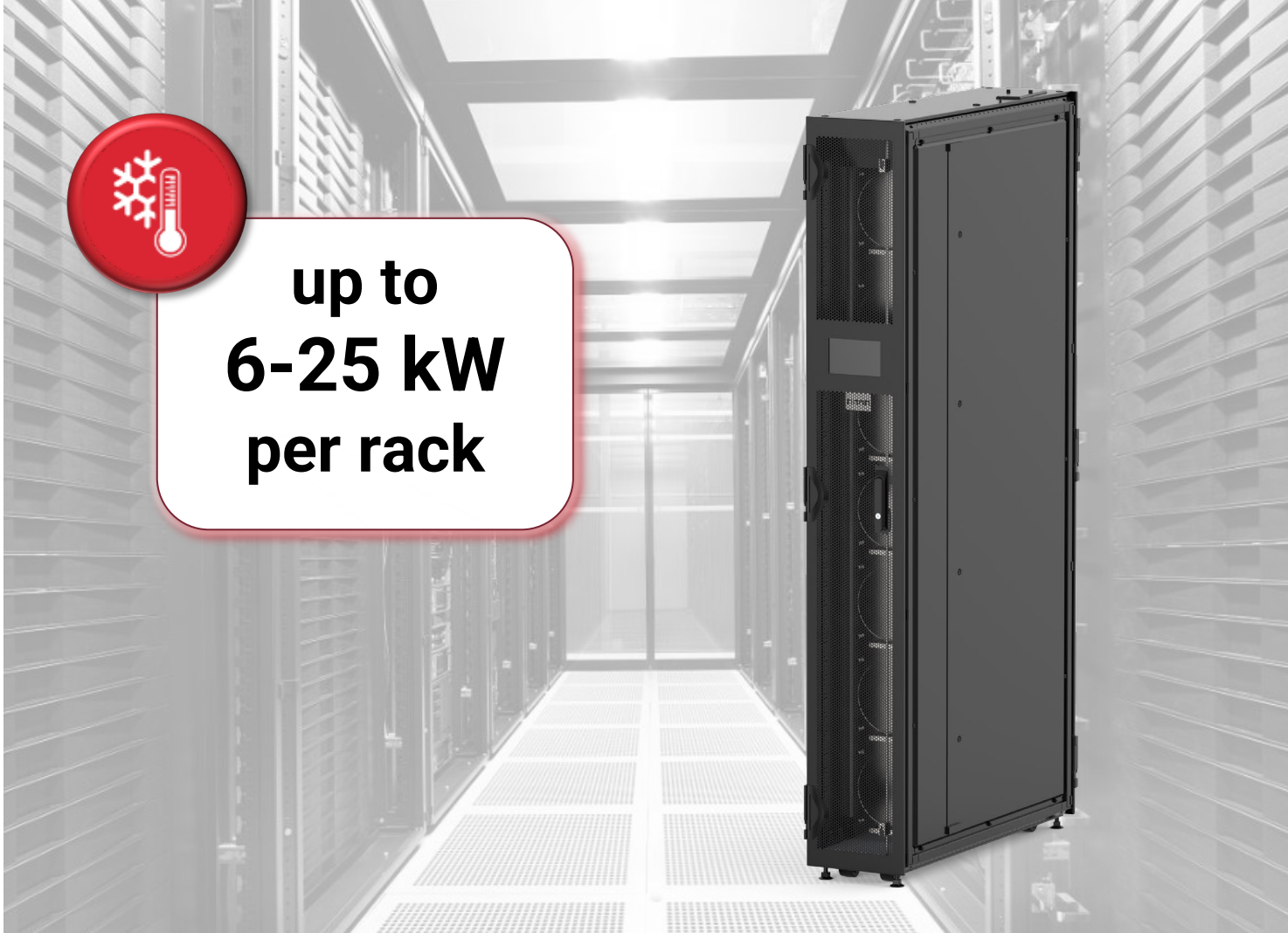


up to  
**8-12 kW**  
per rack

- State of the art
- Proven technology
- Availability of components
  
- Return air temperature  $<35^{\circ}\text{C}$
- Water inlet n/a
- High airflow required  
( $10 \text{ m}^3/\text{h}$  per kW  $\rightarrow$   $100\text{m}^3/\text{h}$  @10kW)

Room based Cooling Solution

# Containment with InRow Cooling



**up to  
6-25 kW  
per rack**

- State of the art
  - Proven technology
  - Availability of components
  - Planning / Redundancies
  - No raised floor mandatory
- 
- Return air temperature <45°C
  - Water inlet <20°C
  - Efficient regulation

**Aisle based Cooling Solution**

# RackChiller 300mm Cooler Technical Specifications

## GENERAL SPECIFICATION

Height	42U (2000mm)
Width	300mm
Depth	1000mm / 1200mm
Power Requirement	230V
Communication Interfaces	Modbus RTU, Modbus TCP, SNMP, Redfish, Web Browser

## FANS

Hot swap fan modules	7 fans
Air flow (100%)	6700 m <sup>3</sup> /hr
Fan shutters for back-flow prevention	
Differential pressure controlled	



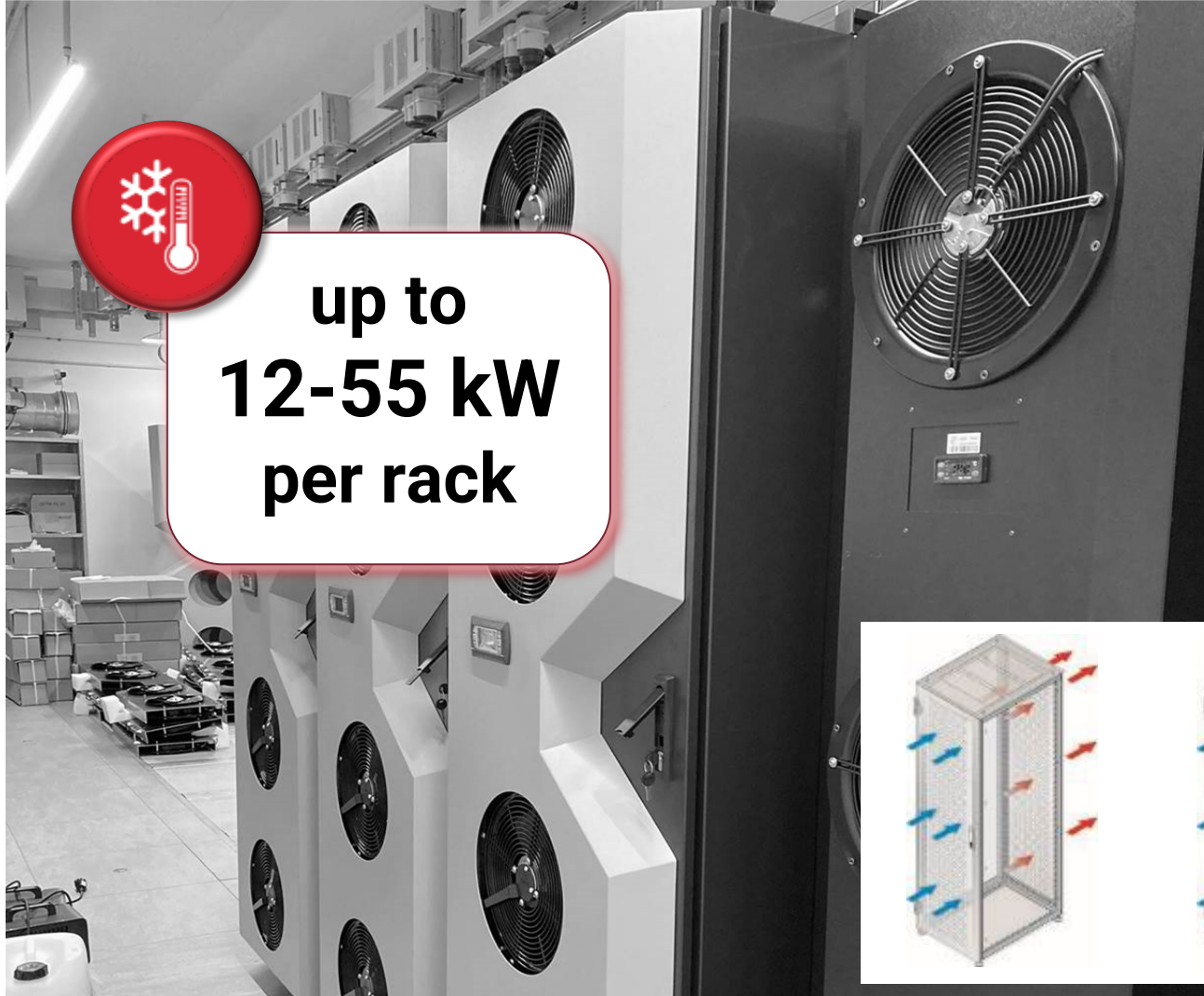
## COOLING PERFORMANCE

Air 6.700 m <sup>3</sup> /h – Water 100 lpm	<b>Performance</b>	<b>48kW</b>	<b>36,9kW</b>
	Air in [°C]	45	45
	Air out [°C]	22,3	27,3
	Delta T air [°C]	22,7	17,7
	Liquid in [°C]	14	20
	Liquid out [°C]	20,9	25,3
	Delta T liquid [°C]	6,9	5,3



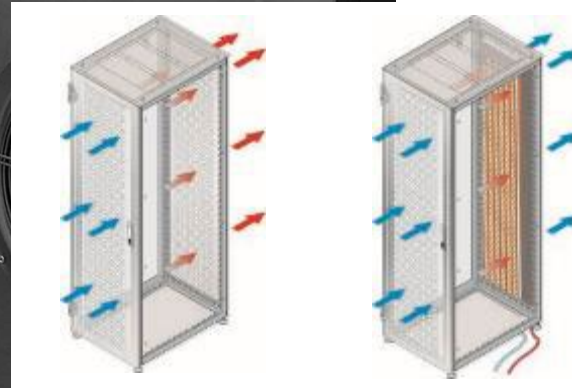


# Rear Door Cooler



up to  
**12-55 kW**  
per rack

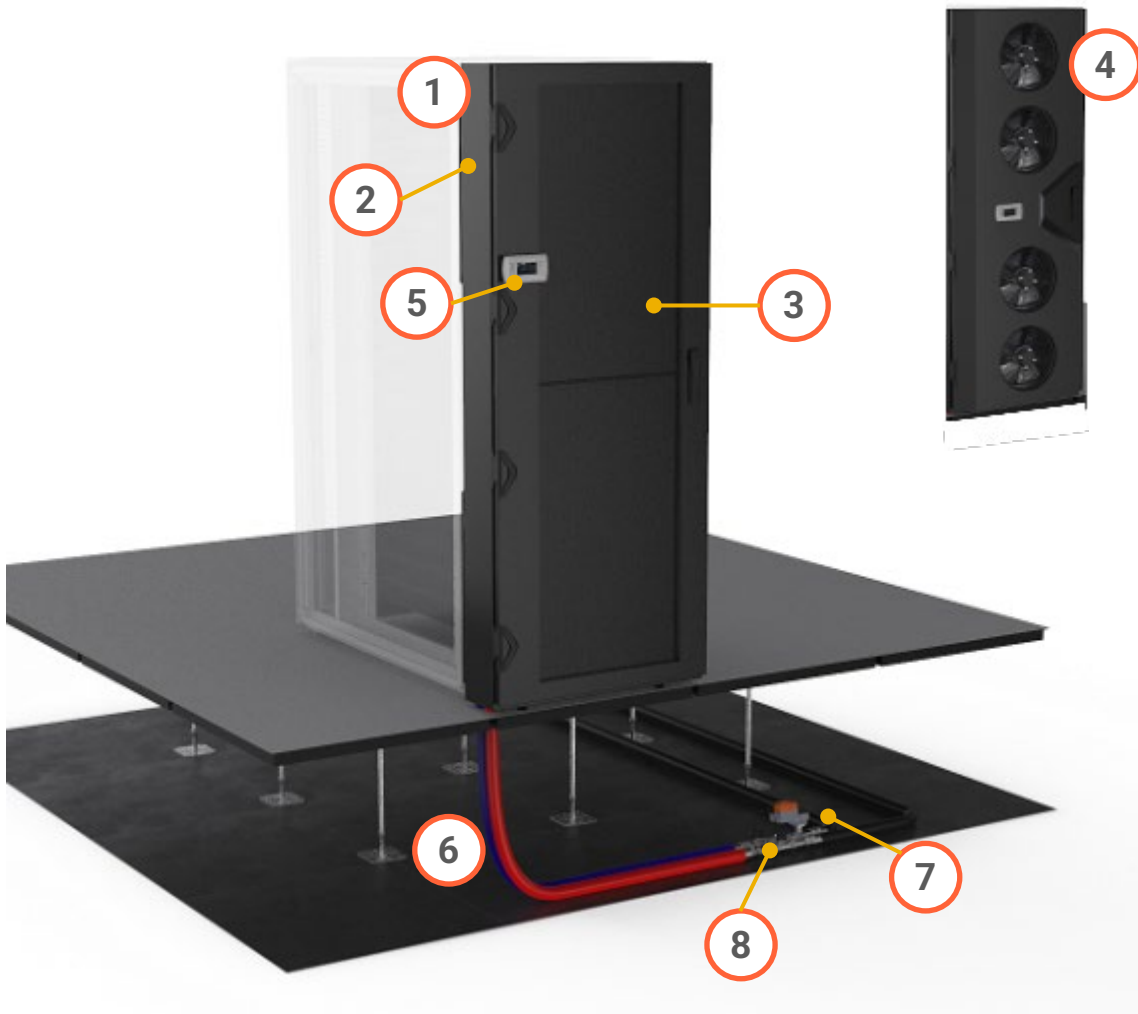
- State of the art (?)
- Proven technology (?)
- Availability of components
- Planning / Redundancies
- No raised floor mandatory
- Can be operated fan less



- Return air temperature  $<50^{\circ}\text{C}$
- Water inlet  $<22^{\circ}\text{C}$
- Efficient regulation

**Rack based Cooling Solution**

# RackChiller Rear Door - Layout



- 1 Mounting frame
- 2 Optional integrated Controller (SNMP and Modbus interface)
- 3 Temperature Sensor
- 4 Active fan solution with integrated air differential pressure sensor
- 5 Optional display
- 6 Optional flexible water hoses
- 7 Optional valve and actuator
- 8 Optional water sensor kit (flow / pressure / temperature)

# New Case Study RDC

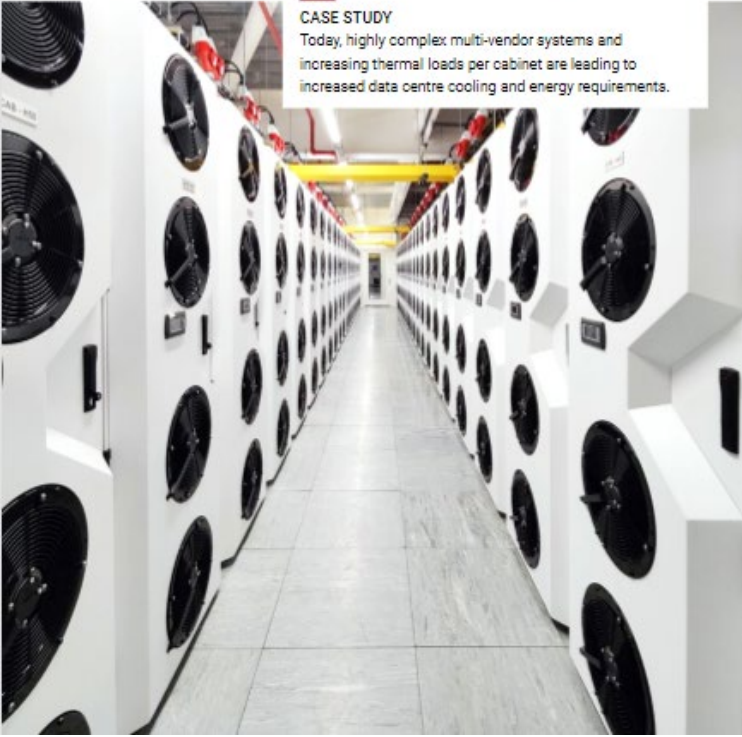


We connect and protect

Smart Precision Cooling – nVent designed a rack-based containment solution, featuring its rear-door mounted chiller unit – RackChiller Rear Door (RDC).

### CASE STUDY

Today, highly complex multi-vendor systems and increasing thermal loads per cabinet are leading to increased data centre cooling and energy requirements.



### Situation

Our customer, a large broadcast company, faces continually evolving challenges caused by technology innovation. Today, highly complex multi-vendor systems and increasing thermal loads per cabinet are leading to increased data centre cooling and energy requirements.

All IT equipment is required to be operated below a specified temperature threshold to maintain maximum reliability and service availability – elevated temperatures (i.e. hotspots) can result in equipment failures and downtime. Additional operating temperatures must be kept with parameters to ensure warranty conditions are broken. Taken together, these requirements are straining existing physical infrastructure systems which were not designed to provide effective and efficient cooling for such high-density critical loads.

In addition, the lifecycle of the facility is limited since there is neither capacity nor capability to accommodate additions to the IT load. For reasons of circularity, it was decided that upgrading the infrastructure would extend the useful working life of the facility without incurring undue embodied carbon emissions.

The customer therefore sought a solution which could not only meet their metrics, but also reduce the ongoing carbon footprint of operations through increased energy efficiency (i.e. lower PUE). A design was sought to upgrade an existing basement data centre to allow higher rack power density and consequently higher performance data processing capability, retaining as much of the existing infrastructure as possible in a 50-rack edge IT installation.

### Solution

Working as cooling specialists in conjunction with IBM, nVent designed a rack-based containment solution, featuring its rear-door mounted chiller unit – RackChiller Rear Door (RDC).

To enable the customer to achieve higher airflow to meet higher rack densities in the future, nVent adapted a standard active RDC with a new fan as a base unit and change the fan design on the coil to optimize regarding the higher airflow. This allowed the company to achieve a higher cooling capacity with the given working parameters using the custom active RDC instead of standard equivalents meant the customer required fewer units. In the aspect, resulting in a lower capital requirement, lower energy consumption and a smaller annual maintenance budget. The RDC approach was proposed as an alternative to InRow cooling, which would have had the undesirable outcome of a significant loss of IT rack space, as well as the requirement for downtime to allow an updated rack layout design to be implemented.

### Results

The solution was designed to work in conjunction with existing racks fitted in the data centre, with containment optimizing PUE through increased efficiency of the cooling cycle, at the same time minimizing upgrade costs as well as disruption to ongoing operations.

- Stable room temperatures
- Hotspots eliminated
- Partial PUE (pPUE) of 1.15 from the cooling
- Aged CRAC units removed from the data centre
- Lower energy opex
- Lower maintenance costs
- More predictable and precise cooling with better control. Room life extended
- Added capacity to accommodate high density equipment. Greater cooling efficiency through containment (hot/cold airstreams segregated)
- Sustainability elements include eliminated embodied carbon, as well as circularity through reuse of infrastructure equipment including racks



Our powerful portfolio of brands: CADDY ERICO HOFFMAN RAYCHEM SCHROFF TRACER

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[nvent.com/SCHROFF](https://www.nvent.com/SCHROFF)

- 65 active RDCs Racks 47RU x 800W
- Assembled at 3rd party cabinets – max 16kW
  - Room Temp approach 24°C
  - Water Supply Temperature 18°C





# LIQUID COOLING ARCHITECTURES

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- Direct to Chip
- Chassis Immersion



# Why liquid cooling?

- **System Level**

- CPU/GPU/Accelerator TDP (thermal design power) exceeding air cooling limits
- Latency issues driving ultra-dense layouts squeezing critical cooling volume
- Air cooled solutions budgeting up to 20% energy at server level

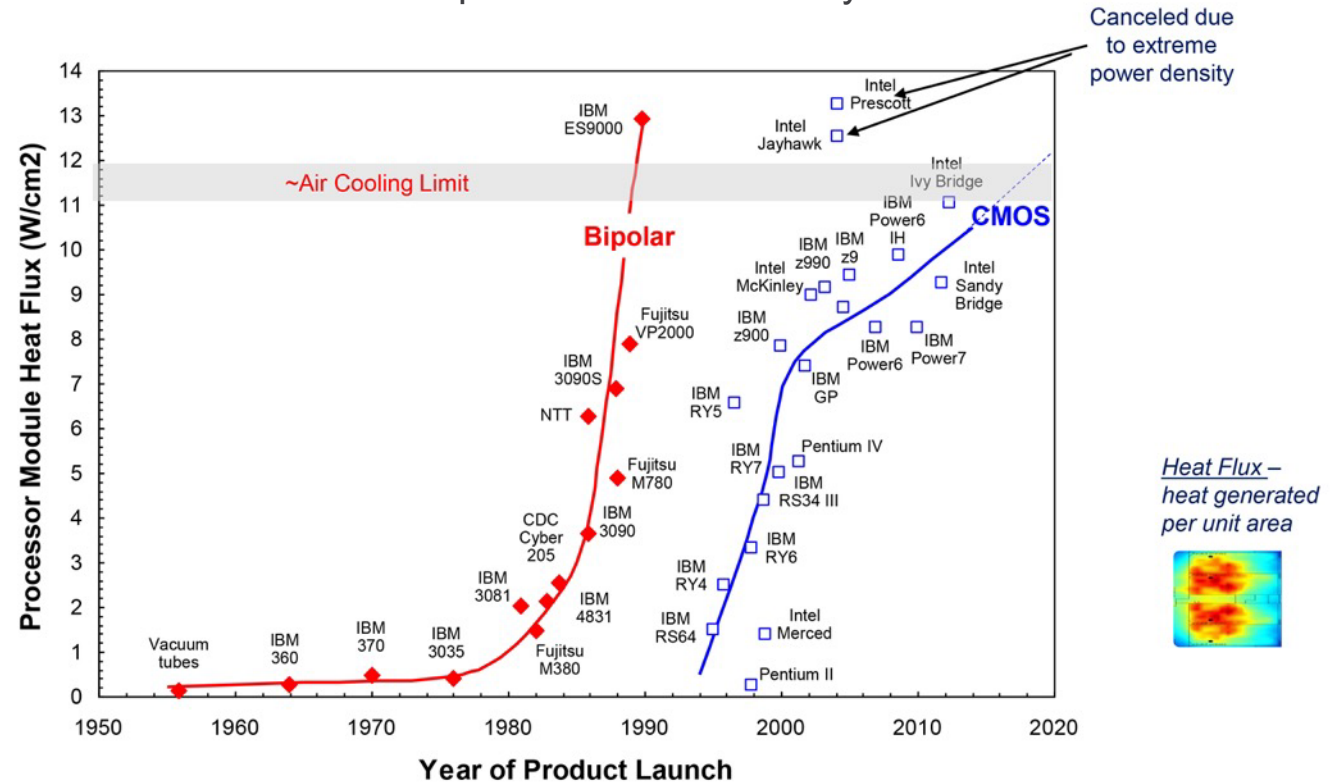
- **Room Level**

- Rack power trends regularly exceeding 20kW in all market segments (~8-12kW capacity typical)
- Airflow limitations being exceeded at rack level

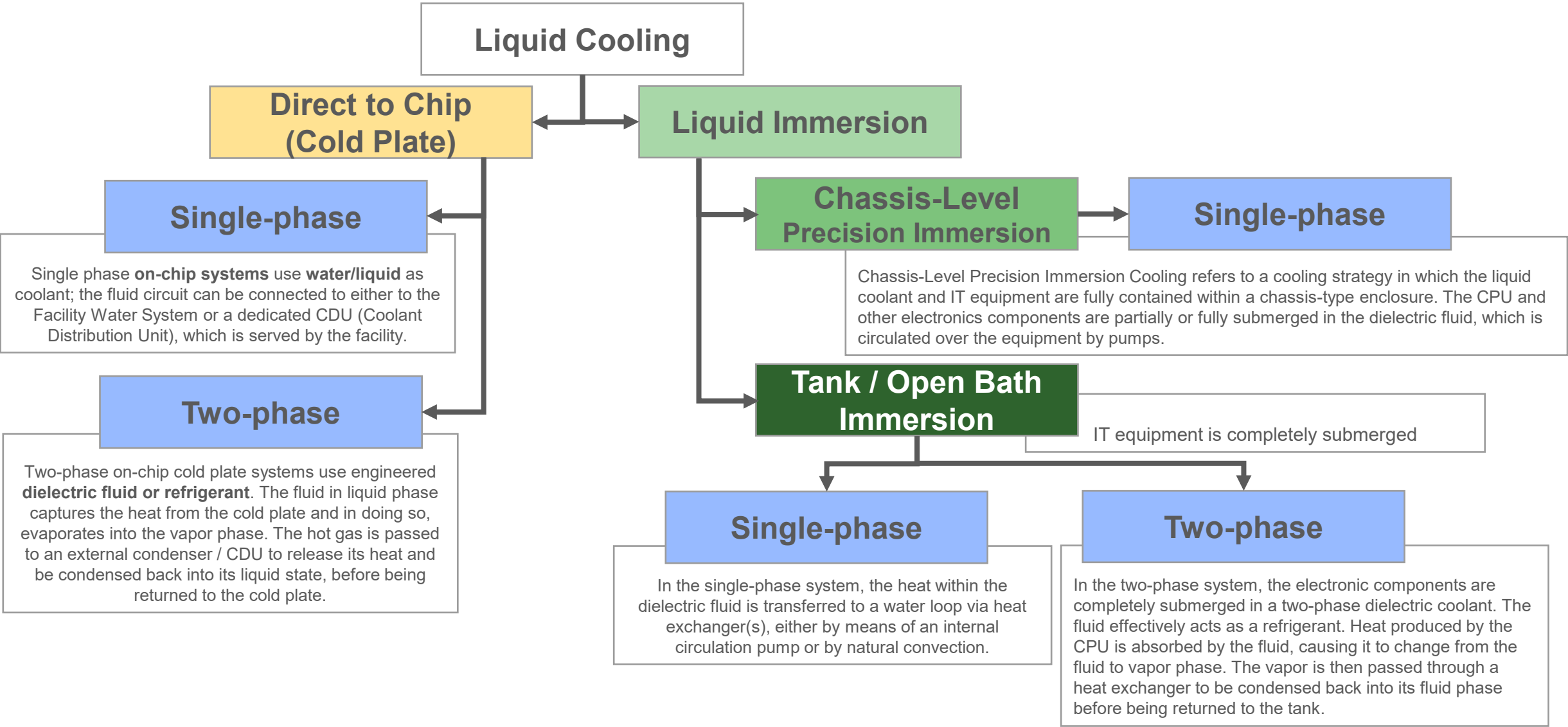
- **Environmental**

- Energy Consumption
- Water Consumption
- CO2 Emissions
- Location Availability
- Critical IT Protection

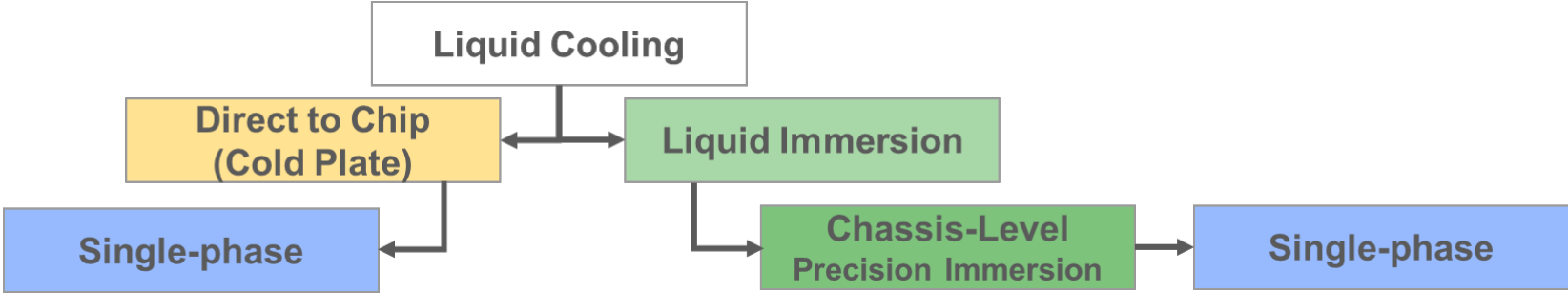
Evolution of processor heat density



# Five main liquid cooling architectures

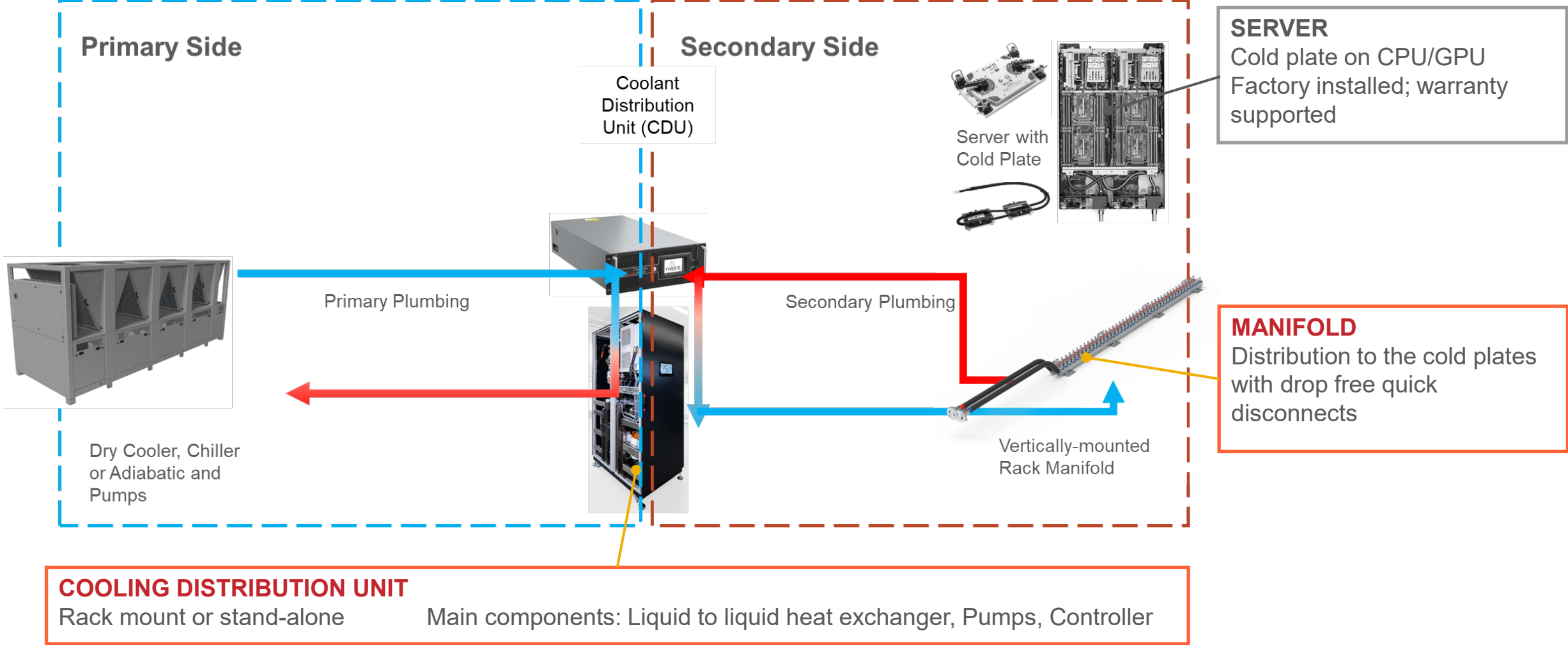


# nVent Liquid Cooling



Facility Water / Cooling System

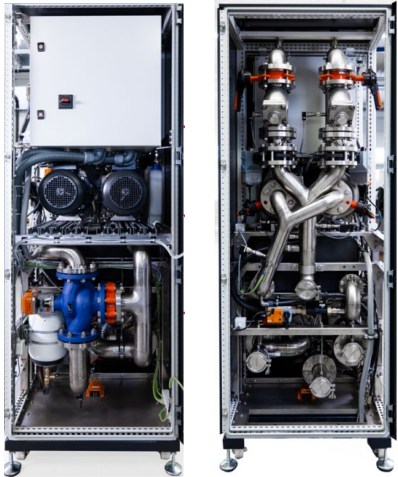
# DIRECT TO CHIP COOLING LAYOUT



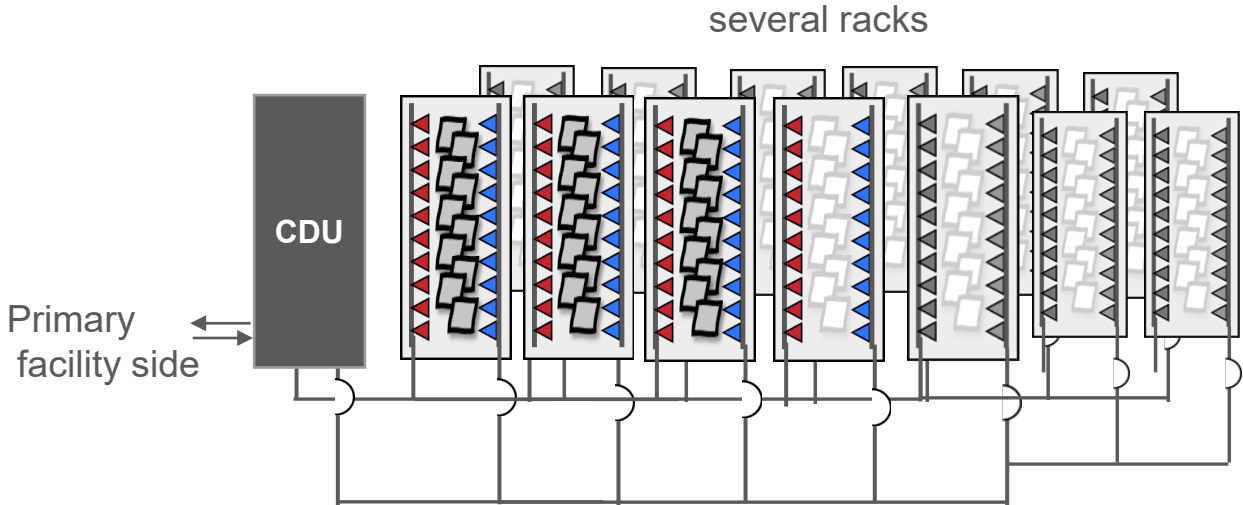
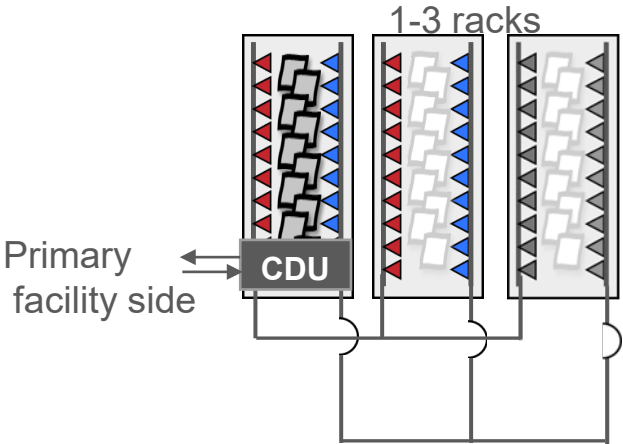
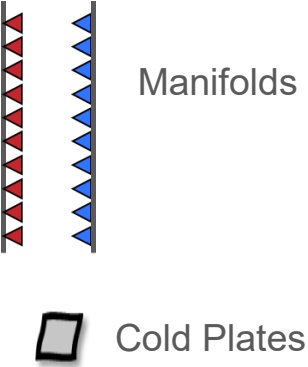


# Design Options

Rack Mount CDUs to Support 1 – 3 racks with Direct to Chip cooled equipment.



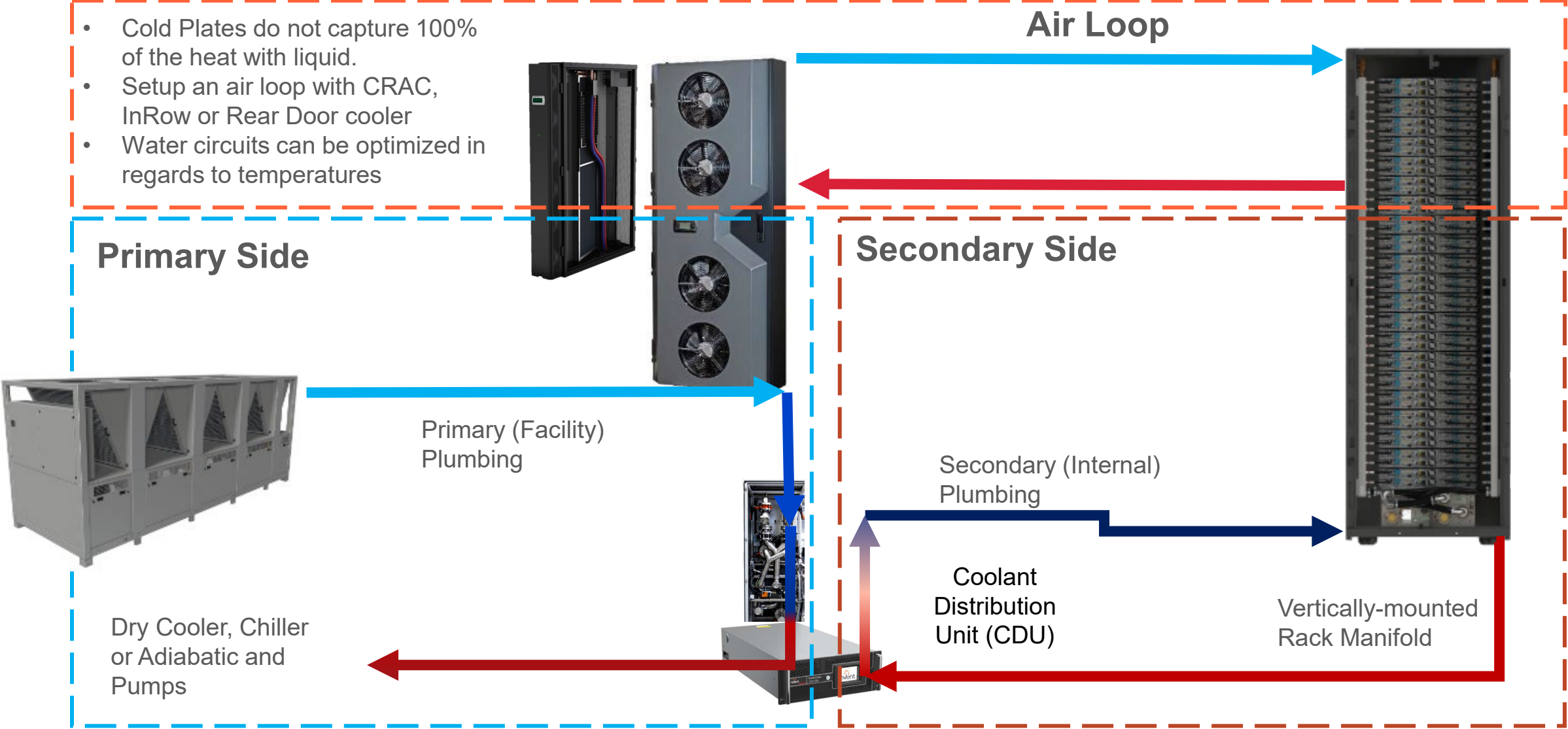
Stand alone CDU to support several racks with Direct to Chip cooled equipment.



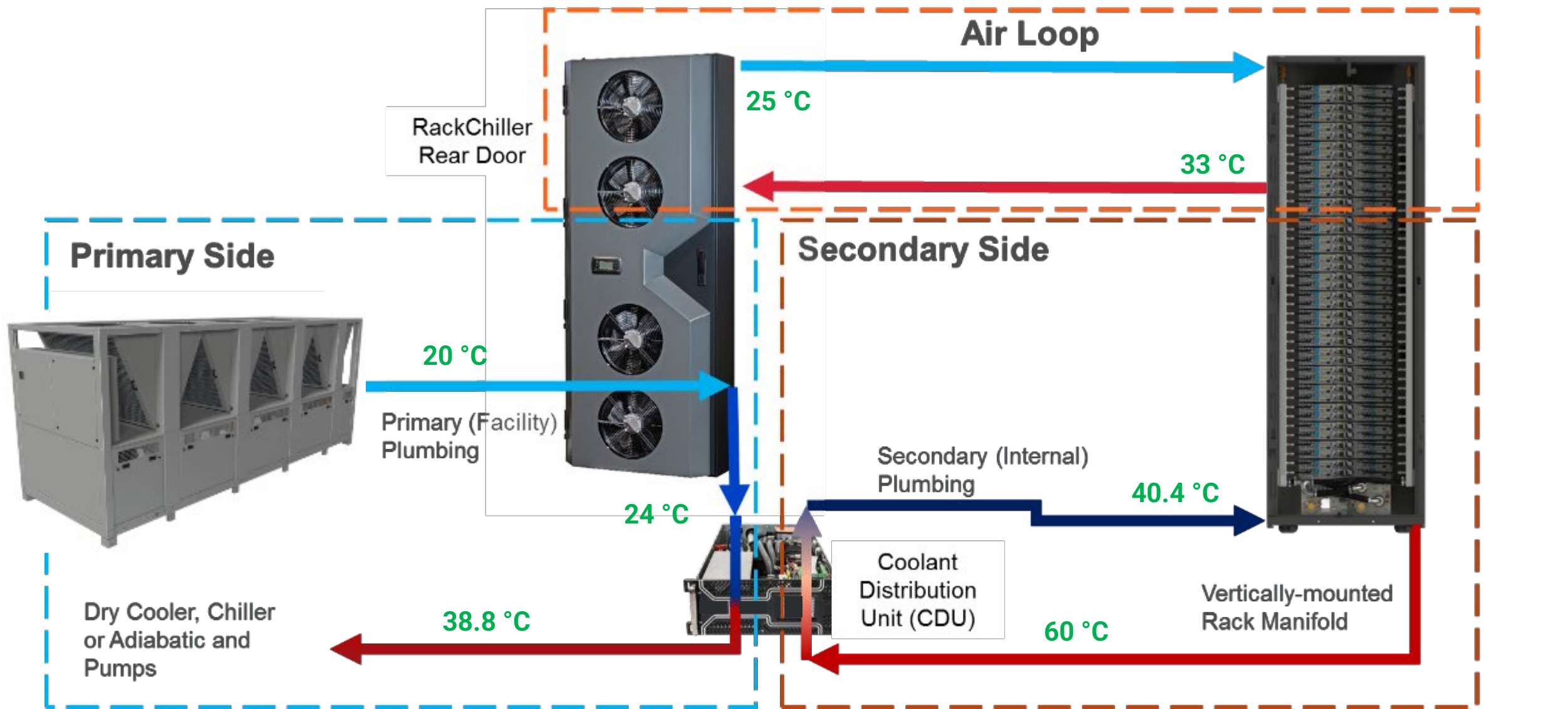


# DIRECT TO CHIP (HYBRID) COOLING SOLUTION LAYOUT

- Cold Plates do not capture 100% of the heat with liquid.
- Setup an air loop with CRAC, InRow or Rear Door cooler
- Water circuits can be optimized in regards to temperatures



# Hybrid Cooling Layouts with Temperatures





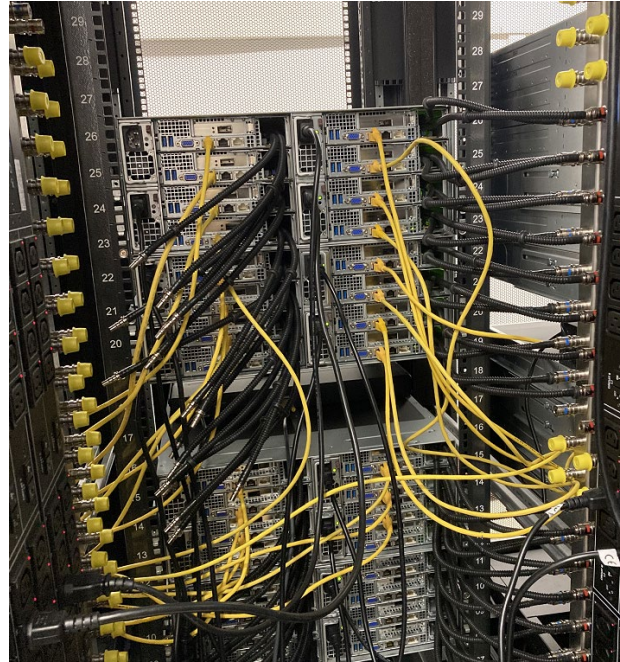
# Direct to Chip Hybrid Cooling Installation

- 9 Racks 47RU x 800W x 1400D
- Passive RDCs
- 4x 63Amp 3P PDUs each rack
- 2 Manifolds (42 connections) to support 2 cold plates at 42RU
- 2 standalone CDUs in Technical Room

**FRONT**



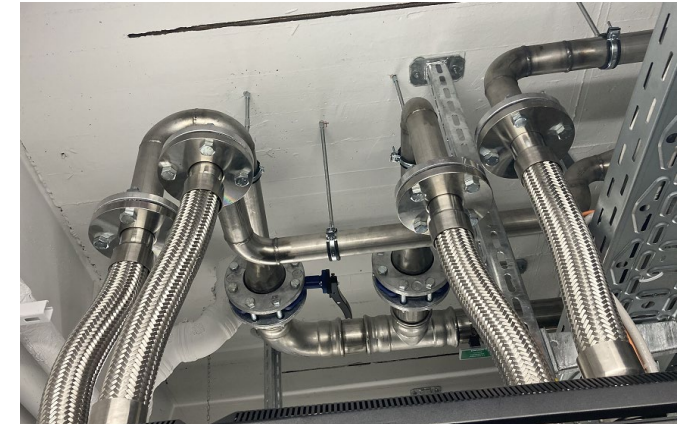
**REAR**



**INSIDE REAR**



**TECNICAL ROOM**

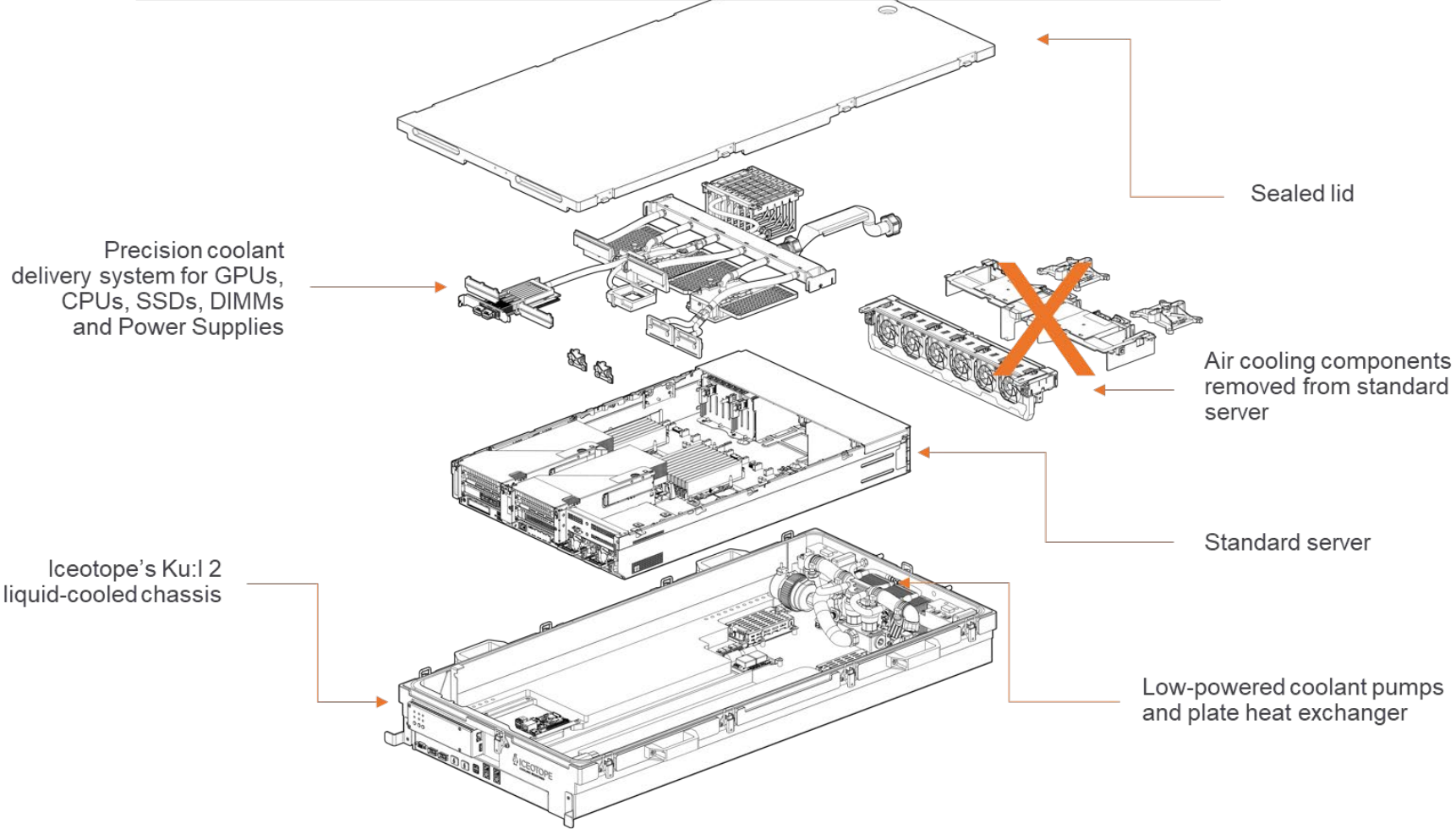


# Chassis Level Immersion



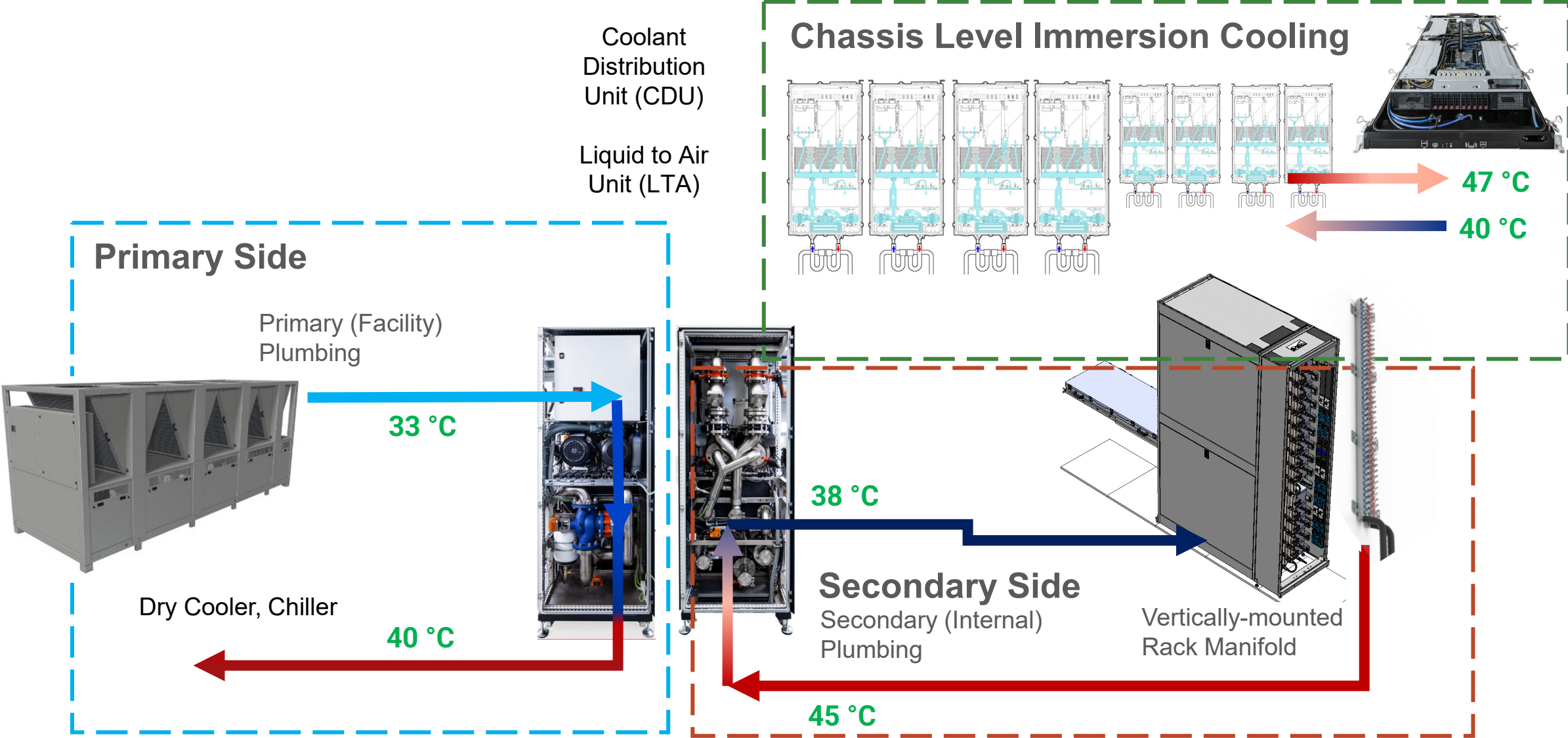
Next step to increase % heat captured by liquid close to 100%

What is it?





# How it works at chassis/rack/facility level



# nVent Data Solutions

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Work with experts to get the best fitting solution

